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PRINCIPLES OF IGNEOUS PETROLOGY.

The Natural History of Igneous Rocks. By A. Harker, F.R.S. Pp. xvi+384. (London: Methuen, 1909.) Price 12*s*. 6*d*. net.

FOR some time the need of a text-book of general petrology in English has been acutely felt, owing to the rapid progress which the science has made in theoretical subjects and the inaccessibility of many of the original memoirs to students and teachers. Most text-books treat the subject from a purely descriptive point of view, and the speculative developments are kept in the background. In fact the literature of descriptive petrology is now so large that an attempt to extract the general conclusions to be deduced from the observations becomes of greater importance than merely to add to the number of ascertained facts. In a book of about four hundred pages Mr. Harker endeavours to meet this demand, and has covered so wide a range and compressed so much information into this brief space that he has achieved a very large measure of success.

The work is confined to the investigation of the principles of igneous petrology, and the metamorphic and sedimentary rocks are excluded from its scope. The title fairly expresses the aims of the book; it is an attempt to treat of igneous rocks in the manner of natural history, taking account not only of their minute anatomy and structure, but also of their distribution, their range in time, and their genetic associations. Of late years there has been a plethora of unnatural systems of petrology, based on purely arbitrary lines. On the best known of these (the "quantitative classification") the author passes severe judgment, and returns to the broader treatment followed by Rosenbusch, Brögger, Judd, and Teall. That combination of geological reasoning with petrological analysis which has always characterised the English school of petrologists finds able expression in the pages of this treatise.

The geographical distribution of recent volcanic rocks is considered in the introductory chapters, and the remarkable association of "Atlantic" and "Pacific" rock types with certain classes of tectonic developments is made the foundation of an appeal for a natural classification. Undoubtedly the facts are most impressive, though we are entirely in the dark regarding their causes; and they afford the clearest indication that in time we shall be in possession of natural systems of petrography. We learn incidentally that the first sketch of this grouping was presented by Mr. Harker, though it has become more generally known through the treatment of Dr. Prior and Prof. Becke. The Tertiary volcanic rocks of the Inner Hebrides are placed among the Pacific types, a conclusion by no means easy to accept, and one which may need to be revised at some future date.

The application of physical chemistry to the crystallisation of magmas is taken up in considerable detail. This part of the book is practically a summary of Prof. Vogt's papers, and leaves nothing to be desired in lucidity of exposition and accuracy of statement. For students it will be of the greatest value, as the original memoirs are loaded with detail, and much too voluminous for their use, and no satisfactory account of them has hitherto appeared in English. We must confess, however, to a certain feeling of disappointment in reading them, a sense of incompleteness. The *a priori* principles are laid down in a very satisfactory fashion, but the applicability of these principles to the actual concrete facts of rock structure and history, which we had a right to expect from a geologist of Mr. Harker's wide experience, is dismissed with scant treatment. The difficulty of interpreting the history of crystallisation in the commonest rocks in terms of the theoretical principles laid down is sure to face the student at an early stage in his studies. We miss in particular any reference to the work of Schreinemaker, who has proved by analytical investigations that in a solution of three minerals in one another, of which two can form mixed crystals, while the third is independent, there are many possible schemes of crystallisation; one mineral may separate out completely at an early stage, and the crystallisation of any substance may be interrupted or repeated. If there are more components, or if we allow for the influence of dissolved gases in the magma, the problem becomes much more complicated; but it is a relief to find that as the theory is better understood the discrepancies between it and the observed facts seem to diminish.

The subject of "hybridism," or mixed rocks, is discussed in a brief chapter, which sums up in admirable fashion the results of the author's work in this difficult field. He takes a middle position between the schools of petrology which deny that igneous rocks dissolve sediments or older rocks with which they come into contact, and those which hold that such processes go on on a large scale, and that many rocks generally regarded as of normal types are thus produced. Mr. Harker's field work enables him to speak on this subject with great authority, and his conclusions are so moderate and so firmly based on sound evidence that he carries us with him in all that he says. There is also a chapter on magmatic differentiation, a subject on which it does not seem possible to say anything that is new, and a very interesting account of the mutual relations of associated igneous rocks which, in our opinion, is the best in the volume. The curves drawn on a very simple graphic system show the variation in the components of allied rock types, and are convincing that some general principles must underlie the facts, though as yet we have been unable to grasp them. The final chapter on classification is unexpectedly brief, and contains an admission that existing systems are merely temporary stop-gaps, and a satisfactory classification must traverse the lines of all current groupings, and will require an entirely new nomenclature. To us this appears unduly pessimistic, and we believe rather that in petrology as in other sciences the future will be the child of the past, and that real progress will not involve the demolition of the older systems, but will include them while giving them a

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sounder basis to rest upon. The book contains two beautiful photographic plates of active volcanoes, and a large number of useful illustrations; in print, paper, and binding it will meet the approval of every book-lover.

J. S. F.

A POPULAR MAMMAL BOOK.

Wild Beasts of the World. By Frank Finn. Pp. viii+188; illustrated. (London and Edinburgh: T. C. and E. C. Jack, 1908–9.) Price 17*s.* net.

THE favourable opinion we formed of Mr. Finn's work when the first part was noticed last year in NATURE we are pleased to be able to endorse now that the complete volume is before us. The book is confessedly a thoroughly popular one, and, therefore, ought to be judged solely from that standard; and from that point of view it may be pronounced a decided success. The author's style of writing is bright and attractive; and in the main his descriptions appear correct and up to date. Mr. Finn has not overloaded his text with names of naturalists and observers about whom the public knows little or nothing; and he has, in our opinion for the most part rightly, altogether ignored subspecies. As regards nomenclature, the author will have nothing to do with modern innovations and changes, and we accordingly find the baboons (and not the flying-lemur) appearing under their old title of Cynocephalus, and the fox as *Canis vulpes*. The fact that such names still dominate in popular literature suggests that they should not, as is now too much the fashion, be ignored in our museums, which are primarily popular institutions.

Mr. Finn appears to take as his texts the hundred mammals represented in the coloured plates, as the descriptions of all these are printed in larger type than is conceded to many of the others noticed. Personally we are not enamoured of this plan, as it suggests that the species to which large type is accorded are of more importance than the rest; but this point is not one affecting the character of the work as a whole.

The coloured plates form, of course, the characteristic of the volume which will appeal most strongly to the general public; and for these illustrations—the only ones in the book—we have in the main nothing but commendation, although some appear rather too brilliantly coloured. A few, moreover, do not indicate important details—notably the one of the hamster, in which the dorsal gland-patch is not shown. The one serious error in the illustrations occurs in part xii., where the plate lettered Marco Polo's wild sheep really represents the true argali (*Ovis ammon*); and there is no excuse for this, as the figures, if we mistake not, have been drawn from the mounted specimens in the British Museum. Nor is this all, for, whereas the figure in the foreground depicts, as we have said, the true Altai argali, the one in the middle distance is taken from its Tian Shan representative. In the concluding part we notice that the plate of the platypus shows the web of the forefoot fully extended when the animal is on land, in place of being folded beneath the palm, as it must be in order that the creature should get a foothold.

Misprints and other errors in the text appear to be few, but we notice on p. 47 *Mipsiprymnus* for *hypsiprymnus*. In the account of the Derbian eland no mention is made of the fact that the species occurs in the Bahr el Ghazal; while the occurrence of the water-chevrotain in East Central Africa is ignored. The old error as to female takin-horns differing in form from those of the male is also repeated.

Most of these are, however, but trifling errors, which detract but little from a work worthy in the main of high praise.

R. L.

APPLIED MECHANICS.

(1) *Applied Mechanics for Engineers.* A Text-book for Engineering Students. By E. L. Hancock. Pp. xi+385. (New York: The Macmillan Co., 1909; London: Macmillan and Co., Ltd.) Price 8*s.* 6*d.* net.

(2) *Machines—Outils, Outillage, Verificateurs.* By P. Gorgeu. Pp. 232. (Paris: Gauthier-Villars, 1909.) Price 7 francs, 50 centimes.

(1) THIS book is intended to be a text-book for engineering students during the first year of their course, and the examples selected to illustrate the principles discussed are, therefore, mainly such as are likely to be met with in practical engineering work. To facilitate the working out of the numerical problems, of which there are nearly 300 scattered through the book, the author has printed in the form of five appendices a series of tables including hyperbolic functions, logarithms of numbers, trigonometrical functions, squares, cubes, square roots, conversion tables, &c.; it is very problematic as to how often such tables incorporated in a text-book are of use to the student—it is much more convenient for him to have a small thin book of mathematical tables, and there are several such books now available, which he can carry about with him in his pocket, and refer to whenever calculations have to be made.

Two very complete chapters are those devoted to centre of gravity and moment of inertia; the application of Simpson's rule to the finding of the area and centre of gravity of rail and similar sections is fully discussed, and the whole subject of the determination of moments of inertia of various standard sections is treated very fully, both by analytical and graphical methods: this is a matter of considerable interest to engineers engaged in structural design work. Another chapter which will be found of use by the engineer in practice as well as by the young student is that dealing with the dynamics of machinery: after dealing with such usual problems as those of the flywheel and connecting-rod in a reciprocating engine, a number of sections is devoted to the gyroscope, and to its application to the mono-rail and similar devices.

The last chapter in the book treats of impact in a

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